FORM PTO-1390 (Modified) (REV 10-95) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
2059	
U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	
10/088311	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP 00/07841	AUGUST 11, 2000	SEPTEMBER 17, 1999

TITLE OF INVENTION

DEVICE AND METHOD FOR WAVELENGTH DEPENDENT LIGHT OUTCOUPLING

APPLICANT(S) FOR DO/EO/US

Stefan EGGERS, Claas ANDREAE

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
    A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☒ Certificate of Mailing by Express Mail
19. ☐ Other items or information:

EL796689186US

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
10/088911	PCT/EP 00/07841	2059

20. The following fees are submitted:.	CALCULATIONS PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :	
☐ Search Report has been prepared by the EPO or JPO **$930.00**	
☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) **$720.00**	
☐ No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) **$790.00**	
☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO **$1,070.00**	
☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) **$98.00**	
ENTER APPROPRIATE BASIC FEE AMOUNT =	**$890.00**
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	11 - 20 =	0	x $18.00	**$0.00**
Independent claims	2 - 3 =	0	x $80.00	**$0.00**
Multiple Dependent Claims **(check if applicable).**			☐	**$0.00**
TOTAL OF ABOVE CALCULATIONS			=	**$890.00**
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable).**			☐	**$0.00**
SUBTOTAL			=	**$890.00**
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).			+	**$0.00**
TOTAL NATIONAL FEE			=	**$890.00**
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).**			☐	**$0.00**
TOTAL FEES ENCLOSED			=	**$890.00**
			Amount to be: refunded	$
			charged	$

☐ A check in the amount of to cover the above fees is enclosed.

☒ Please charge my Deposit Account No. **19-4675** in the amount of **$890.00** to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **19-4675** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

STRIKER, STRIKER & STENBY
103 EAST NECK ROAD
HUNTINGTON, NEW YORK 11743

SIGNATURE

MICHAEL J. STRIKER
NAME

27233
REGISTRATION NUMBER

MARCH 15, 2002
DATE

#2/13

UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No.: 2059

In re:

Applicant: EGGERS

Serial No.:

Filed:

PRELIMINARY AMENDMENT

March 14, 2002

Hon. Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

Preliminarily to the issuance of an Office Action in the above identified application, please amend the same as follows:

In the specification:

Amend the specification as attached.

In the claims:

Cancel all claims without prejudice.

Add the following claims as attached.

REMARKS

This Amendment is submitted preliminarily to the issuance of an Office Action in the above identified application.

With the present Amendment applicants have amended the specification to more clearly define the present invention.

The original claims have been canceled and replaced with a new set of claims including claims 12 and 14, the broadest apparatus and method claims, and the other claims which depend on them.

Consideration and allowance of present application is most respectfully requested.

Should the Examiner require or consider it advisable that the specification, claims and/or drawings be further amended or corrected in formal respects in order to place this case in condition for final allowance, then it is respectfully requested that such amendments or corrections be carried out by Examiner's Amendment, and the case be passed to issue. Any costs involved should be charged to the deposit account of the

undersigned (No. 19-4675). Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing this case to allowance, he is invited to telephone the undersigned (at 631-549-4700).

Respectfully submitted,

Michael J. Striker
Attorney for Applicants
Reg. No. 27233

In the specification:

On page 1, line 3, please provide the following heading:

-- BACKGROUND OF THE INVENTION --

On page 1, cancel first three paragraphs and substitute therefore the following:

The present invention relates to an exposure apparatus comprising a lamp and a condensor device, in particular for wavelength-dependent light outcoupling, whereby a first, wavelength-dependent mirror layer is located with in the exposure beam path to divide the beam path into a first, UV portion for exposure, and into a second, primarily visible and/or IR spectral portion, whereby a second mirror is located in the beam path of the second spectral portion that reflects the second spectral portion back to the first mirror layer.

Such an exposure apparatus for photocopiers is made known in US 4,095,881. The light from a halogen lamp strikes a curved reflector, from which point a parallel bundle of rays is partially reflected by an

interference filter located in front of the lamp in the beam path, and its IR portion is allowed to pass through. The IR portion is reflected back into the lamp via a mirror, in order to warm it up and thereby save electrical energy to operate the lamp.

An exposure method is made known in JP-A-3022518 in which a wavelength selective mirror layer that divides the beam path into a spectral portion used for exposure and into a further spectral portion is penetrated by radiation within the exposure beam path of a lamp. Under normal circumstances, the further spectral portion is focussed on the end of a bundle of light guides that is connected to a device for controlling the correct focussing. The disadvantage of this method is the fact that the entire spectral portion not used for exposure causes the instrument parts radiated by it to heat up considerably. This can lead to the maladjustment or even destruction of the instrument parts.

Cancel the paragraph bridging pages 1 and 2 and substitute therefore:

This object is attained by means of the invention by the fact that a viewing screen is located in the beam path of the light portion of the

second spectral portion reflected on the first mirror layer before the second pass through this first mirror layer, and by the fact that imaging optics are located between the viewing screen and the first mirror layer to image the lamp on the viewing screen.

Amend the last paragraph on page 2 as follows:

The first visible and IR spectral portion which is not used for exposure and passes through the first, preferably wavelength-dependent mirror layer is reflected on the second mirror located, in particular, perpendicular to the propagation of the unused spectral portion, back in the direction of the first mirror layer. Exactly like the first pass, this second passage through the first, preferably wavelength-dependent mirror layer is not complete, either, because residual reflection remains. A portion, A=T*(1-T), is reflected on the mirror layer and diverted in a direction away from the object to a viewing screen, on which an image of the lamp is then created by means of imaging optics. This image is used to adjust the lamp. This allows for a much more effective positioning of the lamp than could be achieved using an unadjusted installation, due to the mechanical tolerances of lamps. The result is a much more accurate illumination of the object to be

illuminated. Appropriate reference marks can be applied on the viewing screen to simplify the adjustment process.

Cancel the second paragraph on page 3 and substitute therefore:

An image of the lamp, the lamp filament, or the lamp electrodes is created on the viewing screen. The exposure apparatus can now be adjusted effectively using this image. The viewing screen preferably comprises a ground-glass screen, on which a mirror-inverted image of the lamp is projected. This simple exemplary embodiment of the viewing screen is cost-effective to manufacture and relates the position of the light source as an image with sufficient accuracy.

Amend the last paragraph on page 3 as follows:

[According to a particularly advantageous exemplary embodiment of the invention, imaging] Imaging optics for imaging the lamp on the viewing screen are located between the viewing screen and the first, preferably wavelength-dependent mirror layer so that an image of the lamp can be displayed on the viewing screen. These imaging optics comprise a

lens system, for example. The advantage of a lens system is the high light intensity and good accuracy. By arranging the lenses appropriately, it is possible to create an enlarged representation of the lamp, which is conducive to a rapid and simplified adjustment of the exposure apparatus. A simple aperture plate can be used in order to reduce assembly. According to the principle of a "hidden camera", this produces a mirror-inverted image of the lamp on the viewing screen, which is designed as a ground-glass screen, for instance.

Cancel the paragraph bridging pages 4 and 5 and cancel the next three full paragraphs on page 5 and substitute therefore:

The object of the method is attained using an exposure method for wavelength dependent light outcoupling according to the invention, in which at least a first, wavelength-dependent mirror layer is penetrated by radiation within an exposure beam path of a lamp to divide the beam path into a first spectral portion used for exposure, and into a second spectral portion, wherein at least one part of the second spectral portion is used to adjust the lamp, wherein the second spectral portion is reflected on a second mirror back in the direction toward the first mirror layer, and wherein the light

portion reflected in the second pass through the first mirror layer is imaged on the viewing screen.

A particularly advantageous aspect of the method is the fact that the lamp can be easily adjusted by means of the image created, and the largest share of the visible light and, mainly, the IR radiation can be kept away from the adjusting device. The largest share of the second spectral portion passes through the mirror layer in the second pass through the preferably wavelength-dependent mirror layer in the direction of the lamp, where the energy is advantageously absorbed by cooling elements already in place. No further cooling elements are necessary, therefore, which allows for a more compact and cost-effective design.

Amend the paragraph bridging pages 5 and 6 as follows:

The method according to the invention is carried out particularly advantageously, [in that] by the fact that the light emitted by a lamp is bundled with the aid of a condensor and, by means of a first, semipermeable, preferably wavelength-dependent mirror layer, is divided into a spectral portion used for exposure and into a second spectral portion, whereby the second spectral portion penetrates the mirror layer and is

reflected back by a second mirror in the direction toward the first mirror layer and is partially diverted on the mirror layer in the direction toward the viewing screen, and an image of the lamp is created on the viewing screen. This image can be used to adjust the lamp. This advantageous exemplary embodiment of the method allows for a very compact design of the device.

On page 6 in line 9, please provide the following heading:

– BRIEF DESCRIPTION OF THE DRAWINGS –.

On page 6, line 15, provide the following heading:

– DESCRIPTION OF THE PREFERRED EMBODIMENTS –.

Cancel page 9 in its entirety.

Amended specification:

Amended last paragraph on page 2:

The first visible and IR spectral portion which is not used for exposure and passes through the first, preferably wavelength-dependent mirror layer is reflected on the second mirror located, in particular, perpendicular to the propagation of the unused spectral portion, back in the direction of the first mirror layer. Exactly like the first pass, this second passage through the first, preferably wavelength-dependent mirror layer is not complete, either, because residual reflection remains. A portion, A=T*(1-T), is reflected on the mirror layer and diverted in a direction away from the object to a viewing screen, on which an image of the lamp is then created by means of imaging optics. This image is used to adjust the lamp. This allows for a much more effective positioning of the lamp than could be achieved using an unadjusted installation, due to the mechanical tolerances of lamps. The result is a much more accurate illumination of the object to be illuminated. Appropriate reference marks can be applied on the viewing screen to simplify the adjustment process.

Amended last paragraph on page 3:

Imaging optics for imaging the lamp on the viewing screen are located between the viewing screen and the first, preferably wavelength-dependent mirror layer so that an image of the lamp can be displayed on the viewing screen. These imaging optics comprise a lens system, for example. The advantage of a lens system is the high light intensity and good accuracy. By arranging the lenses appropriately, it is possible to create an enlarged representation of the lamp, which is conducive to a rapid and simplified adjustment of the exposure apparatus. A simple aperture plate can be used in order to reduce assembly. According to the principle of a "hidden camera", this produces a mirror-inverted image of the lamp on the viewing screen, which is designed as a ground-glass screen, for instance.

Amended paragraph bridging pages 5 and 6:

The method according to the invention is carried out particularly advantageously, by the fact that the light emitted by a lamp is bundled with the aid of a condensor and, by means of a first, semipermeable, preferably wavelength-dependent mirror layer, is divided into a spectral portion used for exposure and into a second spectral portion, whereby the second spectral portion penetrates the mirror layer and is reflected back by a second mirror in the direction toward the first mirror layer and is partially diverted on the

mirror layer in the direction toward the viewing screen, and an image of the lamp is created on the viewing screen. This image can be used to adjust the lamp. This advantageous exemplary embodiment of the method allows for a very compact design of the device.

CLAIMS

New claims:

12. An exposure apparatus, comprising a lamp; a condensor device for wavelength-dependent light outcoupling; a first wavelength-dependent mirror layer located within an exposure beam path of said lamp to divide the beam path into a first UV portion used for exposure, and into a second spectral portion selected from the group consisting of a visible portion, an IR spectral portion, and both; a second mirror located in the beam path of a second spectral portion that reflects the second spectral portion back to said first mirror layer; a viewing screen located in the beam path of a light portion of said second spectral portion before a second pass through said first mirror layer; an imaging optics located between said viewing screen and said first mirror layer to image said lamp on said viewing screen.

13. A device as defined in claim 12, wherein said second mirror has a curved shape.

14. An exposure method for wavelength-dependent light outcoupling, comprising the steps of penetrating at least one first mirror layer

by radiation within an exposure beam path of a lamp to divide the beam path into a first spectral portion used for exposure and into a second spectral portion; using at least one part of the second spectral portion to adjust the lamp; reflecting the second spectral portion on a second mirror back in direction toward the first mirror layer; and imaging the light portion reflected in a second pass through the first mirror layer, on a viewing screen.

15. An exposure method as defined in claim 14; and further comprising absorbing a largest share of the second spectral portion in cooling elements in a lamp housing.

16. An exposure method as defined in claim 14; and further comprising absorbing a largest share of the second spectral portion on cooling elements in a lamp housing.

17. An exposure method as defined in claim 14; and further comprising bundling a light emitted by the lamp with a condensor; and dividing the bundled light into the first spectral portion used for exposure and into the second spectral portion by the first mirror layer which is wavelength-dependent, so that the second spectral portion penetrates the mirror layer, and reflected by the second mirror back in direction toward the first mirror

layer, and is partially diverted on the mirror layer in direction toward the viewing screen, so that an image of the lamp is produced.

DEVICE AND METHOD FOR WAVELENGTH-DEPENDENT LIGHT OUTCOUPLING

The invention relates to an exposure apparatus comprising a lamp and a condensor device, in particular for wavelength-dependent light outcoupling.

Such an exposure apparatus for the exposure of offset printing plates is made known in PCT/EP 98/08081 (unpublished). According to this, the master is broken down into picture segments by means of a computer, and the picture segments are moved in sequence to an electronically controllable light modulator. The controlled light modulator comprises a reflecting digital mirror device, in front of which a field lens is located such that the beam path passes through the field lens toward the digital mirror device and, after modulation and sharp-cornered reflection, it passes back through the field lens.

Numerous problems occur with the exposure apparatuses of the type described hereinabove. On the one hand, the visible and IR spectrum hit the offset printing plate as does the UV spectrum, which is needed for exposure. The high energy content of the light causes the object to be exposed to heat up. The offset printing plate expands and undesired deformations occur, which can lead to blurred images. A further considerable disadvantage of the exposure apparatus described is the fact that no means for the accurate adjustment of the lamp are provided.

The object of the invention is to present an exposure apparatus and a method with which exposure quality can be optimized using simple means.

The object on which the invention is based is attained by means of the invention by the fact that at least a first, preferably wavelength-dependent mirror layer is located within an exposure beam path of a lamp for dividing the beam path into a

first UV portion—preferably used for exposure—and into a second primarily visible and IR spectral portion, and by the fact that a second mirror is located in the beam path of the second spectral portion.

Light is outcoupled in wavelength-dependent fashion using the first, preferably wavelength-dependent mirror layer. The light emitted from the lamp is thereby divided into a UV portion used for exposure, and into an unused, visible and IR spectral portion. The used, UV spectral portion is diverted in the direction toward the lens, while the visible and the IR portion pass through the mirror layer. By optimizing the mirror layer, reflection coefficients of nearly R=100% and transmission coefficients of T=90% can be achieved. By employing a plurality of such units, a suppression of greater than 1:1000 can be achieved with a utilized light efficiency of approximately 98%. Due to light outcoupling, the UV portion is practically all that reaches the offset printing plate for exposure. The energy in the undesired spectral range that is received is very low. No unnecessary heating up—or the negative consequences related therewith—takes place.

The visible and IR spectral portion—which is not used for exposure and passes through the first, preferably wavelength-dependent mirror layer—is reflected on the second mirror located, in particular, perpendicular to the propagation of the unused spectral portion, back in the direction of the first mirror layer. Exactly like the first pass, this second passage through the first, preferably wavelength-dependent mirror layer is not complete, either, because residual reflection remains. A portion, A=T*(1-T), is reflected on the mirror layer and diverted in a direction away from the object to a viewing screen, on which an image of the lamp is then created by means of imaging optics. This image is used to adjust the lamp. This allows for a much more effective positioning of the lamp than could be achieved using an unadjusted installation, due to the mechanical tolerances of lamps. The result is a much more accurate illumination of the object to be illuminated. Appropriate reference marks can be applied on the viewing screen to simplify the adjustment process.

The largest share of the second spectral portion—which is not used for exposure—passes through the mirror layer back in the direction of the lamp, i.e., it does not reach the offset printing plate. The radiant energy can be absorbed here by lamp cooling elements already in place. No further elements are needed to absorb the portion not used for exposure. As a result, the entire apparatus can be designed to be more compact and, in particular, more cost-effective.

According to an especially advantageous exemplary embodiment, a viewing screen is located in the beam path of the light portion of the second, visible or IR spectral portion reflected on the first, preferably wavelength-dependent mirror layer before the second pass through this mirror layer. An image of the lamp, the lamp filament, or the lamp electrodes is created on this viewing screen. The exposure apparatus can now be adjusted effectively using this image. The viewing screen preferably comprises a ground-glass screen, on which a mirror-inverted image of the lamp is projected. This simple exemplary embodiment of the viewing screen is cost-effective to manufacture and relates the position of the light source as an image with sufficient accuracy.

According to a particularly advantageous exemplary embodiment of the invention, imaging optics for imaging the lamp on the viewing screen are located between the viewing screen and the first, preferably wavelength-dependent mirror layer so that an image of the lamp can be displayed on the viewing screen. These imaging optics comprise a lens system, for example. The advantage of a lens system is the high light intensity and good accuracy. By arranging the lenses appropriately, it is possible to create an enlarged representation of the lamp, which is conducive to a rapid and simplified adjustment of the exposure apparatus. A simple aperture plate can be used in order to reduce assembly. According to the principle of a “hidden camera”, this produces a mirror-inverted image of the lamp on the viewing screen, which is designed as a ground-glass screen, for instance.

According to a further advantageous exemplary embodiment of the invention, the imaging and reflecting functions of the imaging optics and the mirror can be combined in one component if the second mirror is designed curved in shape. This design saves costs, because a complicated and cost-intensive lens system between the mirror wall and viewing screen can be eliminated.

The exposure apparatus can be further improved if a reflector is located in the beam path behind the lamp. It creates a reversed image of the lamp in or, preferably, next to the lamp. The light yield can be nearly doubled as a result. Additionally, adjustment can be greatly simplified, because it can now be carried out with the images of the lamp and the lamp image positioned side-by-side on the viewing screen.

The arrangement of the individual components is extremely important to achieve a particulary space-saving and efficient design of the apparatus. For example, a condensor and the semipermeable mirror layer are located in the beam path behind the lamp in the ray direction. The semipermeable mirror layer divides the light into a first, preferably, UV portion used for exposure, and into a second spectral portion, preferably the visible and IR portion. A mirror is located in linear succession after the second spectral portion, which mirror reflects the second spectral portion back in the direction toward the semipermeable mirror layer, which is situated so as to divert part of the second spectral portion to the viewing screen. In this fashion, all functions are realized in a very compact design. The light reflected back into the lamp and not used for exposure is absorbed there by cooling elements. Parts of this second spectral portion serve to adjust the lamp with the aid of the viewing screen. The fact that only the used, preferably UV portion reaches the offset printing plate is particularly advantageous.

The object of the method is attained using an exposure method according to the invention, in particular for wavelength-dependent light outcoupling, in which at least a first, preferably wavelength-dependent mirror layer is penetrated by

radiation within an exposure beam path of a lamp to divide the beam path into a spectral portion used for exposure, and a second spectral portion, wherein at least one part of the second spectral portion is used to adjust the lamp. The advantage of this is the fact that the adjustment can take place with a very high degree of accuracy using very simple means. It is further emphasized that, with this method, the actual unused spectral portion can be used before absorption, instead of being dissipated directly.

A particularly unusual aspect of the method is the fact that the second spectral portion is reflected on a second mirror back in the direction toward the first, preferably wavelength-dependent mirror layer. The mirror is advantageously situated perpendicular to the direction of propagation of the unused spectral portion for this purpose, so that all of it is reflected in the direction toward the first mirror layer.

A particularly advantageous aspect of the method according to the invention is the fact that the spectral portion reflected in the second pass through the first, preferably wavelength-dependent mirror layer is imaged on a viewing screen. The lamp can be easily adjusted using the image that is created.

The largest share of the second spectral portion passes through the mirror layer in the second pass through the preferably wavelength-dependent mirror layer in the direction of the lamp, where the energy is advantageously absorbed by cooling elements already in place. No further cooling elements are necessary, therefore, which allows for a more compact and cost-effective design.

The method according to the invention is carried out particularly advantageously, [in that] the light emitted by a lamp is bundled with the aid of a condensor and, by means of a first, semipermeable, preferably wavelength-dependent mirror layer, is divided into a spectral portion used for exposure and into a second spectral portion, whereby the second spectral portion penetrates the mirror layer and is

reflected back by a second mirror in the direction toward the first mirror layer and is partially diverted on the mirror layer in the direction toward the viewing screen, and an image of the lamp is created on the viewing screen. This image can be used to adjust the lamp. This advantageous exemplary embodiment of the method allows for a very compact design of the device.

This is described in greater detail using the drawings, which represent an exemplary embodiment of the invention.

Figure 1 shows a schematic representation of the device according to the invention, and the method, and

Figure 2 shows a schematic representation of the beam path in an exposure apparatus for printing plates using a digital mirror device.

An exposure apparatus 10 is shown in Figure 1. A condensor 2 is located in the beam path of the lamp 1, onto which the divergent bundle of rays emitted by the lamp 1 falls and leaves this as a parallel bundle of rays. The parallel bundle of rays radiates in the direction toward a semipermeable mirror layer 7 located in the further course of the beam path. This semipermeable mirror layer 7 divides the light beams into a first UV portion 14 used for exposure, and into a second, visible and IR portion 15. The second spectral portion 15 passes through this wavelength-dependent mirror layer 7 and, in linear succession after it, hits a second mirror 16 which reflects the second spectral portion back to the mirror layer 7, which is positioned at a 45-degree angle to the beam path of the second spectral portion 15. Part of this second spectral portion 17 is now reflected at a 90° angle, passes through imaging optics 18, and hits a viewing screen 19. The used spectral portion 14 is diverted by the mirror layer 7 directly in the direction of the object 21 or before by means of further mirror layers. A reflector 22 is located on the side of the lamp 1 opposite to the condensor 2, which reflector 22 creates a reversed image 23 of the lamp in or, preferably, next to the lamp 1. The

light yield can be nearly doubled as a result. Additionally, adjustment can be greatly simplified, because it can now be carried out with the images of the lamp and the lamp image positioned side-by-side on the viewing screen 19. The radiant energy of the unused spectral portion is absorbed by lamp cooling elements 20. No further light-absorbing elements are required.

Figure 2 shows the beam path in an exposure apparatus for printing plates using a digital mirror device 3. The drawing shows an exposure apparatus 10 comprising a lamp 1, a condensor device 2, a light modulator designed as digital mirror device 3, a field lens 4 located directly in front of the digital mirror device 3, and a projection lens 5. Also located in the beam path after the condensor 2 is a large converging lens 6, a first wavelength-dependent mirror layer 7, a converging lens having a smaller diameter, and a plane mirror 9. A second mirror 16 is located behind the wavelength-dependent mirror layer 7, which second mirror 16 can be designed parabolic in shape, for example, depending on the exemplary embodiment. Imaging optics and a viewing screen are positioned at an angle above this.

A divergent bundle of rays 11 leaves a lamp 1 and falls upon the condensor device, then exits it as a parallel bundle of rays 12. The parallel bundle of rays 12 strikes the large converging lens 6, which forms a convergent bundle of rays out of this, which convergent bundle of rays achieves its smallest cross-section in front of the converging lens 8. The wavelength-dependent mirror layer 7 divides the bundle of rays 13 into a first UV portion 14 and a second visible and IR portion 15. The UV portion 14 is reflected downward at an angle by the wavelength-dependent mirror layer 7 and reaches the converging lens 8. Before the small converging lens 8, the UV portion 14 is reflected further on the plane mirror 9 and continues upward at an angle, where it strikes the field lens 4. A parallel bundle of rays—not described further—passes through the field lens 4 and strikes the digital mirror device 3, where it is reflected at an acute angle and passes back through the field lens 4. The field lens 4 forms a convergent bundle

of rays out of the reflected rays, which convergent bundle of rays travels downward normally into the projection lens 5.

The second, visible and IR portion 15 passes through the wavelength-dependent mirror layer 7 and, in linear succession after it, strikes a second mirror 16, which reflects the second spectral portion 15 back toward the wavelength-dependent mirror layer. A part 17 of this second spectral portion—passing through imaging optics 18—is now reflected on a viewing screen 19, by way of which the lamp 1 can be adjusted. The largest share of the second spectral portion passes back through the first mirror layer and returns to the lamp 1, where it is absorbed by cooling elements 20.

Reference Numerals

1: Lamp
2: Condensor
3: Digital mirror device
4: Field lens
5: Projection lens
6: Large converging lens
7: Wavelength-dependent mirror layer
8: Converging lens
9: Plane mirror
10: Exposure apparatus
11: Divergent bundle of rays
12: Parallel bundle of rays
13: Convergent bundle of rays
14: UV spectral portion
15: Second spectral portion
16: Second mirror
17: Reflected part of the second spectral portion
18: Imaging optics
19: Viewing screen
20: Cooling elements
21: Object
22: Reflector
23: Image of the lamp

What is claimed is:

1. An exposure apparatus (10) comprising a lamp (1) and a condensor device (2), in particular for wavelength-dependent light outcoupling, wherein at least a first, preferably wavelength-dependent mirror layer (7) is located within an exposure beam path of a lamp (1) to divide the beam path into a first UV portion (14) used preferably for exposure, and into a second, primarily visible or IR spectral portion (15), and wherein a second mirror (16) is located in the beam path of the section spectral portion (15).

2. The device according to Claim 1, wherein a viewing screen (19) is located in the beam path of the light portion (17) of the second visible or IR spectral portion (15) reflected on the first, preferably wavelength-dependent mirror layer (7) before the second pass through this mirror layer (7).

3. The device according to one of the preceding claims, wherein imaging optics (18), in particular an aperture plate, are located between the viewing screen (19) and the first, preferably wavelength-dependent mirror layer (7) to image the lamp (1) on the viewing screen (19).

4. The device according to one of the preceding claims, wherein the second mirror (16) is designed curved in shape.

5. The device according to one of the preceding claims, wherein a condensor (2) is located in the beam path behind the lamp (1), and a reflector (22) is assigned to the lamp.

6. The device according to one of the preceding claims,

wherein a condensor (2) and the semipermeable mirror layer (7) are located in the beam path behind the lamp (1) in the ray direction, which semipermeable mirror layer (7) divides the light into a first, preferably UV portion (14) used for exposure, and a second spectral portion (15), preferably the visible and IR portion, whereby a mirror (16) is located in linear succession after the second spectral portion (15), which mirror (16) reflects the second spectral portion (15) back in the direction toward the semipermeable mirror layer (7), which is situated so as to divert part of the second spectral portion to the viewing screen (19).

7. An exposure method, in particular for wavelength-dependent light outcoupling, in which at least one first, preferably wavelength-dependent mirror layer (7) is penetrated by radiation within an exposure beam path of a lamp (1) to divide the beam path into a spectral portion used for exposure (14) and into a second spectral portion (15),
wherein at least one part of the second spectral portion (15) is used to adjust the lamp (1).

8. The method according to Claim 7,
wherein the second spectral portion is reflected on a second mirror (16) back in the direction toward the first, preferably wavelength-dependent mirror layer (7).

9. The method according to one of the Claims 7 and 8,
wherein the light portion (17) reflected in the second pass by the first, preferably wavelength-dependent mirror layer (7) is imaged on a viewing screen (19).

10. The method according to one of the Claims 7 through 9,
wherein the largest share of the second spectral portion is absorbed in or on cooling elements (20) in the lamp housing.

11. The method according to one of the Claims 7 through 10,

wherein the light emitted by a lamp (1) is bundled with the aid of a condensor (2) and is divided into a spectral portion used for exposure (14) and into a second spectral portion (15) by means of a first semipermeable, preferably wavelength-dependent mirror layer (7), whereby the second spectral portion (15) penetrates the mirror layer (7) and is reflected back by a second mirror (16) in the direction toward the first mirror layer (7) and is partially diverted on the mirror layer (7) in the direction toward the viewing screen (19), and an image of the lamp (1) is created on the viewing screen (19).

Abstract of the Disclosure

The invention relates to an exposure apparatus, in particular for wavelength-dependent light outcoupling, in which at least one preferably wavelength-dependent mirror layer is located within an exposure beam path of a lamp, which mirror layer is used to divide the beam path into a spectral portion used for exposure, and into an unused spectral portion. The object of the invention is to provide an exposure apparatus and a method with which the quality of exposure can be optimized using simple means. The object on which the invention is based is attained according to the invention by locating a mirror in the beam path of the unused region of the spectrum that reflects the unused spectral range in the direction of a mirror layer, and a portion of this is projected onto a viewing screen for adjustment purposes.

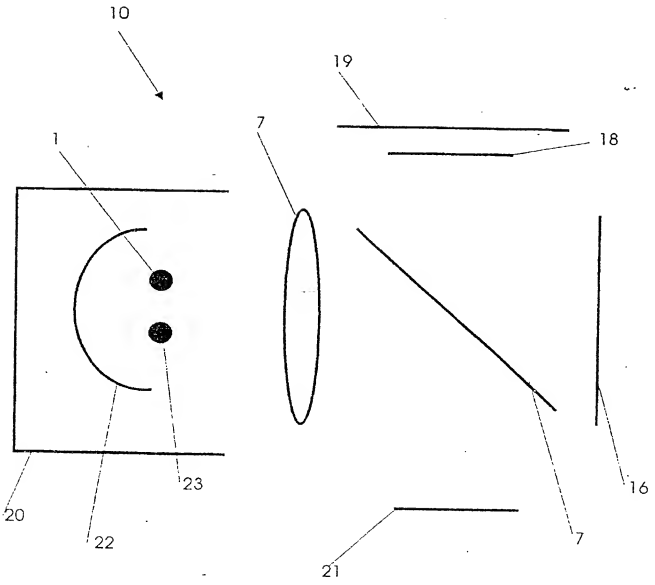
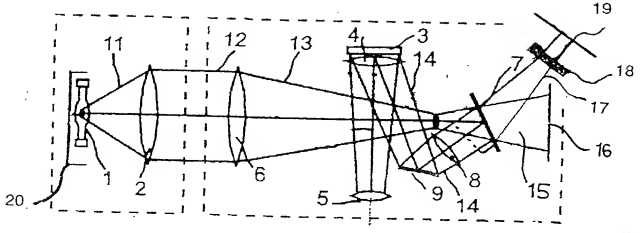


Fig. 1

Fig. 2



DECLARATION AND POWER OF ATTORNEY FOR NATIONAL STAGE OF PCT PATENT APPLICATION

As a below-named inventor, I hereby declare that:

Stefan EGGERS
Claas ANDREAE

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **DEVICE AND METHOD FOR WAVELENGTH DEPENDENT LIGHT OUTCOUPLING** the specification of which was filed as PCT International Application number PCT/EP 00/07841 filed on August 11, 2000.

I hereby state that I believe the named inventor or inventors in this Declaration to be the original and first inventor or inventors of the subject matter which is claimed and for which a patent is sought.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365 (b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s):			Priority claimed:	
199 44 761.6	GERMANY	SEPTEMBER 17, 1999	X	
(Number)	(Country)	(Date filed)	Yes	No
(Number)	(Country)	(Date filed)	Yes	No

As a named inventor, I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statement

may jeopardize the validity of the application or any patent issued thereon.

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Full Name of Fifth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Sixth Inventor:	Citizenship:	
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